

REMARKS

Status of the Claims

Claims 1-14, 16-26, and 71-74 are now pending in the present application, Claim 15 having been cancelled by applicants, Claims 27-70 having been cancelled as non-elected in response to a previous restriction requirement, and new Claims 72-74 having been added in the present amendment. Applicants have amended Claims 1-3, 5-7, 9-13, 16, 23, 25, and 71, as set forth above, to more clearly define the present invention.

Proposed Drawing Changes

The Examiner has objected to FIGURE 14, because reference sign "92a" is not indicated in the Figure, but is discussed in the specification. Enclosed is a proposed change to FIGURE 14, indicated in red ink.

In reviewing the drawings and specification as requested by the Examiner, applicants noted that a line connecting blocks 12 and 16b in FIGURE 2 is poorly positioned. Accordingly, also enclosed is a proposed change to FIGURE 2, indicated in red ink.

Claims Rejected under 35 U.S.C. § 112

The Examiner has rejected Claims 1-26 and 71 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention. The Examiner requires clarification for a number of different terms employed in the claims. Appropriate amendments have been made.

With respect to Claims 1, 5, 10, 13, 16, 25, and 71, the Examiner takes exception to the phrase "desired chemical product." While applicants do not understand why such a phrase should be considered indefinite (as the Examiner clearly understands that chemical reactors process reactants to achieve a chemical product), in order to advance the prosecution in the present application, the term "desired" has been removed. Applicants note that the term "desired" has been deleted from Claims 1, 6, 7, 9, 10, 13, 16, 25, and 71. The term "desired" was not found in Claim 5.

Claim 3 has been amended to recite *wherein at least one reactant supply source and said first reaction module is configured to accommodate a reactant that is in a gaseous state*; thereby obviating the Examiner's rejection that the reactants are not part of the invention.

Claim 9 has been amended to address the antecedent basis issue noted by the Examiner.

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1 Claim 10 has been amended to recite that *each additional processing module comprising a*
2 *reaction module being configured to receive a product from the reaction module completing an*
3 *immediately preceding synthesis step*, thereby clarifying the structural relationship of the additional
4 processing modules to the other elements of the apparatus. With respect to the Examiner's assertion
5 that the term "sufficient additional reaction modules" is vague and indefinite, applicants respectfully
6 note that the claim *does* include language that links the number of processing modules to a number of
7 synthesis steps (note "sufficient additional reaction modules" has been amended to "sufficient
8 additional processing modules"), thus one of ordinary skill in the art would have no trouble
9 determining what number of reaction modules is sufficient. Claim 10 specifically recites "*each*
10 *additional synthesis step being completed in a different one of the additional processing modules.*"
11 The number of additional processing modules used is based on the number of synthesis steps required
12 to produce the chemical product. Claim 9 (from which Claim 10 depends) recites a second reaction
13 module that completes a second synthesis step. If five synthesis steps are required, then three
14 additional processing modules including reaction modules are sufficient (one each being used for
15 steps three, four, and five, respectively).

16 While the Examiner may believe that other language could have been drafted to explain this
17 concept more clearly, the test for indefiniteness is whether the language employed would be
18 understood by one possessing the ordinary level of skill in the pertinent art at the time the invention
19 was made. Since multi-step synthesis reactions are known in the art, and the claim language clearly
20 recites each additional synthesis step being performed in an additional processing module including a
21 reaction module, one of ordinary skill in the art can readily determine how many additional
22 processing modules including a reaction module are sufficient, based on the number of synthesis
23 steps required. MPEP 2173.02 specifically requires claims to be held to a *reasonable* standard of
24 clarity, and that some latitude in the manner of expression and the aptness of terms should be
25 permitted, even though the claim language is not as precise as the Examiner might desire. Claim 10
26 as amended defines the invention with sufficient clarity that one of ordinary skill in the art would
27 understand the invention.

28 Claim 11 employs functional language to recite that the system can be used to produce
29 different classes of chemical products by replacing the reactor. The specific designs of different
30 reactors are not being claimed, merely the ability of the system to accommodate different reactors, to

1 produce different classes of chemical products. While the Examiner is correct that the claim does not
2 recite detailed structural limitations, the use of functional language is not justification for the
3 rejection of an apparatus claim. MPEP 2173.05(g) clearly states that:

4 A functional limitation is an attempt to define something by what it does,
5 rather than by what it is (e.g., as evidenced by its specific structure or specific
6 ingredients). There is nothing inherently wrong with defining some part of an
7 invention in functional terms. Functional language does not, in and of itself,
8 render a claim improper.

9 It was held that the limitation used to define a radical on a chemical compound
10 as "incapable of forming a dye with said oxidizing developing agent" although
11 functional, was perfectly acceptable because it set definite boundaries on the
12 patent protection sought.

13 Claim 11 is not indefinite, because it recites definite boundaries on the patent protection
14 sought (i.e., that the reactors employed in the invention be selected as suitable for producing different
15 classes of products).

16 With respect to the Examiner's rejection of Claim 14, applicants respectfully disagree that
17 there is any basis for an indefiniteness rejection. Claim 13 recites that the reaction module comprise
18 means for facilitating production of the chemical product. Claim 14, which is dependent on
19 Claim 13, defines the means recited in Claim 13 as being implemented by at least one of three
20 different structures. Since the recited "means plus function clause" is an element of the reaction
21 module as defined in Claim 13, the different structures recited in Claim 14 are also elements of the
22 reaction module. Thus, it is not apparent why there exists any indefiniteness as to how the structures
23 recited in Claim 14 relate to the other elements of the apparatus, since by definition, they are
24 elements of the reaction module as defined in Claim 13.

25 The Examiner has rejected Claim 23, asserting that "undesired material" is indefinite.
26 Because the very nature of a filter is to remove a contaminant or undesired material, it is not clear
27 why anyone of ordinary skill in the art would not be able to interpret the term "undesired material."
28 However, in the interest of facilitating prosecution, applicants have amended the claim to delete the
29 term objected to by the Examiner.

30 With respect to Claim 25, it appears the Examiner's rejection is based solely on the fact that
the claim language employs functional limitations. Such rejections are improper, as indicated in
MPEP 2173.05(g), which was cited above. Claim 25 recites definite boundaries on the patent

1 protection being sought, albeit using functional language. Because the metes and bounds of the claim
2 are not vague, the indefiniteness rejection should be withdrawn.

3 The Examiner has rejected Claim 26 due to the use of the terms "quick connect" and "rapid."
4 The term "rapid" has been deleted, but the term "quick connect" is defined in the specification on
5 page 18, line 19, and refers to a specific class of connectors. Bayonet connectors are recited as an
6 example of that class on connectors. However, use of the term "bayonet connector" would be
7 unnecessarily limiting, as other types of quick connect connectors can be employed. Because those
8 of ordinary skill in the art would recognize the term "quick connect" as describing a general class or
9 type of connectors, the term is not indefinite or relative, but instead clearly identifies a well-known
10 class of connectors.

11 Claims Rejected under 35 U.S.C. § 102 in View of Chaussonnet

12 The Examiner has rejected Claims 1, 3-5, 9, 10, 13, 14, 18, 20, 22, 25, and 71 as being
13 anticipated by Chaussonnet (U.S. Patent No. 5,730,947). Chaussonnet discloses a system for the
14 treatment of liquid and gas products. The system has a single thermolysis reactor, a control, and
15 reactant supplies. The Examiner concludes that Chaussonnet discloses an equivalent to applicants'
16 claimed invention. Applicants have significantly amended the claim structure, and the amended
17 claims distinguish over Chaussonnet for the following reasons.

18 Claims 1 and 71 have been amended to recite a control module *"comprising a processor, a*
19 *reaction database, and a user interface, the control module being configured to enable a user to*
20 *interact with the user interface to select a specific reaction to produce the chemical product, from a*
21 *plurality of different reactions stored in the reaction database, so that in response to a selection*
22 *made by a user, the processor automatically controls the modular system to produce the chemical*
23 *product according to reaction parameters for the specific reaction that was selected, said reaction*
24 *parameters being stored in the reaction database."* Chaussonnet does not disclose *"a reaction*
25 *database," "a user interface," or "a processor" that "automatically controls the modular system to*
26 *produce the chemical product according to reaction parameters for the specific reaction that was*
27 *selected,"* which are *"stored in the reaction database."* Thus, independent Claims 1 and 71 are
28 distinguishable over Chaussonnet. Claims 2-26 are dependent on Claim 1, and are distinguishable for
29 at least the same reasons. Accordingly, the rejection of Claims 1, 3-5, 9, 10, 13, 14, 18, 20, 22, 25,
30 and 71 as being anticipated by Chaussonnet should be withdrawn.

1 Claims Rejected under 35 U.S.C. § 102 in view of Bard

2 The Examiner has rejected Claims 1, 3-5, 9-11, 13-15, 18, 20-23, 25, 26, and 71 as being
3 anticipated by Bard (U.S. Patent No. 5,580,523). Bard discloses a modular reactor system for
4 synthesizing chemical compounds characterized by a uniform temperature throughout the reaction
5 mixture by use of a continuous flow reactor under high pressure. The apparatus includes a number of
6 generic components such as pumps, flow channels, manifolds, flow restrictors, and valves, as well as
7 modular reactors, separators, and analyzers on an assembly board. A computer can be used to control
8 reactant flow and temperatures. The Examiner has concluded that Bard discloses an equivalent to
9 applicants' claimed invention. However, applicants have significantly amended the claims, and the
10 amended claims clearly distinguish over Bard for the following reasons.

11 As noted above, Claims 1 and 71 have been amended to recite a control module that enables a
12 user to select a specific reaction from a reaction database including a plurality of different reactions.
13 A user selects one of those reactions, and the processor uses reaction parameters stored in the reaction
14 database for the selected reaction to automatically control the system to produce the chemical
15 product. While Bard discloses using a computer to control some process conditions, the reaction
16 database recited in applicants' claims, and an interface enabling a user to select from among a
17 plurality of stored reactions, as recited by applicants' claims, are not disclosed or suggested by Bard.
18 Thus, independent Claims 1 and 71 patentably distinguish over Bard. Claims 2-26 are dependent on
19 Claim 1, and are patentable for at least the same reasons. Accordingly, the rejection of Claims 1,
20 3-5, 9-11, 13-15, 18, 20-23, 25, 26, and 71 as being anticipated by Bard should be withdrawn.

21 Claims Rejected under 35 U.S.C. § 103 over Bard in view of Dugan

22 The Examiner has also rejected Claim 2 under 35 U.S.C. § 103(a) as being obvious over Bard
23 (U.S. Patent No. 5,580,523) in view of Dugan (U.S. Patent No. 5,658,537). The Examiner asserts
24 that while Bard does not disclose a reactor including both mixing and reaction volumes, Dugan
25 discloses a reactor including both mixing and reaction volumes, and a combination of Dugan and
26 Bard would achieve an equivalent invention. The Examiner indicates that the combination would
27 have been obvious, because making elements integral involves ordinary skill in the art. Applicants
28 disagree for the following reasons.

29 Claim 1, from which Claim 2 depends, has been amended to recite a control module that is
30 not disclosed or suggested by Bard or Dugan. Thus, the proposed combination is not equivalent to

1 the invention defined by applicants' amended claims. Accordingly, the rejection of Claim 2 as being
2 obvious over Bard in view of Dugan should be withdrawn.

3 Further, with respect to the Examiner's reliance on *In Re Wolfe* 116 USPQ 443, the cited case
4 concludes that with respect to making a two-piece handle a one-piece handle "...there is nothing in
5 the mere making of the two-part structure integral other than a matter of engineering choice."
6 However, integrating a mixing volume and a reaction volume into an integrated reactor is not as
7 simple as making a two-piece handle as a one-piece handle. The Examiner cites Bard, which teaches
8 a "chip" based reactor, and Dugan, which teaches a stacked plate reactor. The Examiner appears to
9 argue that modifying Bard's reactor to include a mixing volume, as Dugan's reactor does, is merely a
10 matter of engineering design. However, the reactor designs disclosed by Dugan and Bard are so
11 radically different, it does not appear that modifying Bard's reactor to include Dugan's mixing
12 volume is a simple modification, and clearly, such a modification is NOT simply a matter of design.
13 Bard's reactor is disclosed as a volume having an inlet and an outlet, preferably formed using
14 photolithographic or injection molding techniques, neither of which are applicable to produce
15 Dugan's stacked plate reactor. The steps required to fabricate Dugan's stacked plate reactor do not
16 meet Bard's requirement for a component that is "inexpensive and easy to assemble" (column 5,
17 line 3). Not only does Bard teach away from making the modification proposed by the Examiner, the
18 changes required appear too significant to be dismissed as merely "a matter of engineering design."

19 Claims Rejected under 35 U.S.C. § 103 over Bard in view of Ghosh

20 The Examiner has also rejected Claim 6 and 7 under 35 U.S.C. § 103(a) as being obvious over
21 Bard (U.S. Patent No. 5,580,523) in view of Ghosh (U.S. Patent No. 5,961,932). The Examiner
22 asserts that Bard discloses both a reaction chamber and a residence time chamber, and that Ghosh
23 discloses a reaction chamber formed of capillaries whose length can be varied to control residence
24 time. The Examiner notes that the combination would have been obvious because the required
25 changes represent only routine skill. Applicants disagree for the following reasons.

26 As noted above, the relevant independent claim (Claim 1) has been amended to recite a
27 control module distinguishable over any elements disclosed by Bard or Ghosh. Thus the suggested
28 combination is not equivalent to the invention defined by the amended claims. Accordingly, the
29 rejection of Claims 6 and 7 as being obvious over Bard in view of Ghosh should be withdrawn.

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1 Further, applicants note that Bard discloses manipulating the size of the reaction module to
2 control residence time, which is distinctly different than using a separate module (i.e., a reactor) for
3 initiating a reaction, and yet another module for providing sufficient residence time. Bard teaches
4 that sufficient residence time is achieved by changing the design of a reactor – not by adding a
5 separate module. Applicants' claimed invention can achieve different residence times using the same
6 reactor by changing the residence time module. In this case, separating the function of providing an
7 environment for a reaction and controlling residence time into two components represents a function
8 not achievable when residence time is controlled by changing the reactor. Ghosh also teaches
9 changing the design of the reactor to achieve a different residence time and does not teach or suggest
10 that residence time can be varied by using the same reactor and selecting from among different
11 residence time modules. The combination suggested by the Examiner does not enable residence
12 times to be varied without changing the reactor, while the claimed invention can use same reactor and
13 change the residence time by replacing the residence time module. For this additional reason,
14 Claims 6 and 7 are distinguishable over the cited art.

15 Claims Rejected under 35 U.S.C. § 103 over Bard

16 The Examiner has also rejected Claims 8, 12, and 24 under 35 U.S.C. § 103(a) as being
17 obvious over Bard (U.S. Patent No. 5,580,523). The Examiner asserts that Bard discloses using
18 valves and asserts that it would have been obvious to include a valve in a residence time module.
19 The Examiner notes that Bard inherently discloses controlling pressure in a residence time module
20 and further discloses inlet and outlet ports, a housing, and a frame. The Examiner concludes that
21 adding a reservoir would have been obvious. Applicants disagree for the following reasons.

22 As noted above, Claim 1, from which Claims 8, 12, and 24 depend, has been amended to
23 recite a control module clearly distinguishing over Bard. Thus, Bard is not equivalent to the
24 invention defined by amended Claim 1. Accordingly, the rejection of Claims 8, 12, and 24 as being
25 obvious over Bard should be withdrawn.

26 Further, with respect to Claim 8, applicants note that Bard only discloses placing valves
27 upstream of the reactor module, as shown in FIGURE 4 (valves Va, Vb, Vw), FIGURE 5 (valves 204
28 and 207), FIGURE 6 (valve 303), and FIGURE 9 (valve 603). The function of valves 406 and 413 in
29 FIGURE 7 are not disclosed by Bard and these valves ought not to form the basis of any rejection.
30 Applicants have amended Claim 5 to clearly recite the additional processing module (the residence

1 time module is an additional processing module) is disposed downstream of the reactor. There is
2 simply no teaching or suggestion in Bard of disposing a proportional valve downstream of a reactor
3 to control pressure conditions in the system. For this additional reason, Claim 8 distinguishes over
4 the cited art.

5 Claims Rejected under 35 U.S.C. § 103 over Bard in view of Ashmead

6 The Examiner has also rejected Claims 16, 17, and 19 under 35 U.S.C. § 103(a) as being
7 obvious over Bard (U.S. Patent No. 5,580,523) in view of Ashmead (U.S. Patent No. 5,534,328).
8 The Examiner asserts that the cited art discloses the recited elements and that the required
9 modification would be obvious, because they represent a matter of engineering design. Applicants
10 disagree for the following reasons.

11 As noted above, the relevant independent claim (Claim 1) has been amended to recite a
12 control module distinguishing over Bard and Ashmead. Thus, the suggested combination is not
13 equivalent to the invention defined by the amended claims. Accordingly, the rejection of
14 Claims 16, 17, and 19 as being obvious over Bard in view of Ashmead should be withdrawn.

15 Patentability of New Claims

16 Claims 72 and 73 have been added to respectively recite a microreactor, and a reactor
17 comprising a mixing volume and a reaction volume, in regard to the invention defined in Claim 71.
18 Claims 72 and 73 ultimately depend on Claim 71, and are patentable for at least the same reasons.
19 Claim 74 has been added to recite a microreactor. Claim 74 depends on Claim 1, and is patentable
20 for at least the same reasons. These elements are fully disclosed by the specification and were
21 originally recited in the claim structure as filed.

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1 In view of the preceding amendments and remarks, it will be apparent that all claims in this
2 case define a novel and non-obvious invention. The application is in condition for allowance and
3 should be passed to issue without further delay. Should any further questions remain, the Examiner
4 is asked to telephone applicants' attorney at the number listed below.

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6 Respectfully submitted,

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9 Ronald M. Anderson
10 Registration No. 28,829

11 I hereby certify that this correspondence is being deposited with the U.S. Postal Service in a sealed
12 envelope as first class mail with postage thereon fully prepaid addressed to: Commissioner for Patents, P.O.
Box 1450, Alexandria, VA 22313-1450, on July 16, 2003.

13 Date: July 16, 2003

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16 RMA/MCK:ssa

17 Enclosures

18 Proposed Red Ink Changes to FIGURES 2 and 14 (2 sheets)
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